REMARKS/ARGUMENTS

Applicant received the Office Action dated May 5, 2004, in which the Examiner: (1) rejected claims 1-31 and 33-36 as obvious in view of U.S. Patent No. 6,363,371 ("Chaudhuri") and U.S. Patent No. 6,272,487 ("Beavin"); and (2) objected to claim 32 as being dependent on a rejected base claim but otherwise allowable. In this Response, Applicant amends claims 1, 3, 6, 8, 10, 13, 21 and 31-32. Applicant also adds new claims 37-43. Based on the amendments and arguments contained herein, Applicant respectfully requests reconsideration and allowance of the pending claims.

I. CLAIM REJECTIONS

Amended claim 1, in part, requires "determining a selectivity estimate for predicates in the query using the preferred single column statistic and a cross product of row counts for two columns selected from the plurality of columns." None of the references cited by the Examiner, nor combination of the references, appears to teach or suggest "a cross product of row counts for two columns selected from the plurality of columns" as required in claim 1.

Chaudhuri appears to teach a server 222 that selects one of multiple query plans "P(Q,S)" based on cost "C(Q,S)" (see col. 6, lines 2-46). The plans and cost use suitable statistics "S" such as "the number of distinct values in a column, the density of values in the column, and the second highest and second lowest values in the column" (see col. 6, lines 62-67). However, Chaudhuri does not teach or suggest "a cross product of row counts" as suggested by the Examiner (see Office Action, page 4, paragraph 3). None of the references cited by the Examiner, nor combinations of the references, teaches or suggests the above limitation. For at least this reason, Applicant submits that claim 1 and all claims that depend from claim 1 are allowable.

Amended claim 8, in part, requires "determining a selectivity estimate for predicates in the query using the first and second preferred single column statistics and a cross product of row counts for two columns selected from the plurality of columns." As described previously, with respect to claim 1, none of the references cited by the Examiner, nor combinations of the references,

teaches or suggest "a cross product of row counts for two columns" as required in claim 8. For at least this reason, Applicant submits that claim 8 and all claims that depend from claim 8 are allowable.

Claim 21 was amended to replace "selectivity" with "third selectivity" to ensure proper antecedent basis. The amendment does not change the scope of claim 21. Claim 21, in part, requires "determining a first selectivity estimate based on an assumption that the columns are substantially independent of each other" and "determining a second selectivity estimate based on an assumption that the columns are substantially dependent on each other." Claim 21 further requires "determining a third selectivity estimate for predicates in the query using the first and second selectivity estimates, the third selectivity estimate being used in optimizing processing of the query by the database management system." None of the references cited by the Examiner appears to teach or suggest this limitation.

Beavin teaches a system that "reduces the problem caused by column correlation during query optimization by removing the independence assumption when a new type of multi-column statistic is available" (see col. 2, lines 35-38). Therefore, Beavin does not teach or suggest the "third selectivity estimate" of claim 21 because the "the third selectivity estimate" is determined using both the "first selectivity estimate" (independent column estimate) and the "second selectivity estimate" (dependent column estimate). None of the references cited by the Examiner, nor combinations of the references, teaches or suggests the above limitations. For at least this reason, Applicant submits that claim 21 and all claims that depend from claim 21 are allowable.

Claim 31 was amended to correct a typographical error. The scope of claim 31 has not changed. Claim 31, in part, requires "determining a first selectivity estimate based on an assumption that the columns are substantially independent of each other" and "determining a first factor as a measure of a skew of the plurality of columns and as a measure of a dependence of a plurality of the columns." Claim 31 further requires "determining a second selectivity estimate for predicates in the query using the first selectivity estimate

and the first factor." As described previously, with respect to claim 21, none of the references cited by the Examiner, nor combinations of the references, teaches or suggests "a selectivity estimate" based on both "an assumption that the columns are substantially independent of each other" and "a measure of a dependence of a plurality of the columns" as required in claim 31. For at least this reason, Applicant submits that claim 31 and all claims that depend from claim 31 are allowable.

II.   NEW CLAIMS

Claim 37, in part, requires a "compiler that, when executed by the processor, determines a join selectivity value of two columns based on a first selectivity value that assumes the two columns are dependent and a second selectivity value that assumes the two columns are independent." As described previously, with respect to claim 21, none of the references cited by the Examiner, nor combinations of the references, teaches or suggests this limitation. For at least this reason, Applicant submits that claim 37 and all claims that depend from claim 37 are allowable.

Claim 41, in part, requires that a computer "estimate a cost associated with carrying out each of the logically equivalent methods, wherein said estimate a cost comprises determining a join selectivity for two columns based on a first selectivity value that assumes the two columns are dependent and a cross product of row counts for each of the two columns." As described previously, with respect to claim 1, none of the references cited by the Examiner, nor combinations of the references, teaches or suggests "determining a join selectivity for two columns" based on "a cross product of row counts for each of the two columns" as required in claim 41. For at least this reason, Applicant submits that claim 41 and all claims that depend from claim 41 are allowable.

III.   CONCLUSIONS

In the course of the foregoing discussions, Applicant may have at times referred to claim limitations in shorthand fashion, or may have focused on a particular claim element. This discussion should not be interpreted to mean that the other limitations can be ignored or dismissed. The claims must be viewed as

a whole, and each limitation of the claims must be considered when determining the patentability of the claims. Moreover, it should be understood that there may be other distinctions between the claims and the cited art which have yet to be raised, but which may be raised in the future.

Applicant respectfully requests that a timely Notice of Allowance be issued in this case. If any fees or time extensions are inadvertently omitted or if any fees have been overpaid, please appropriately charge or credit those fees to Hewlett-Packard Company Deposit Account Number 08-2025 and enter any time extension(s) necessary to prevent this case from being abandoned.

Respectfully submitted,

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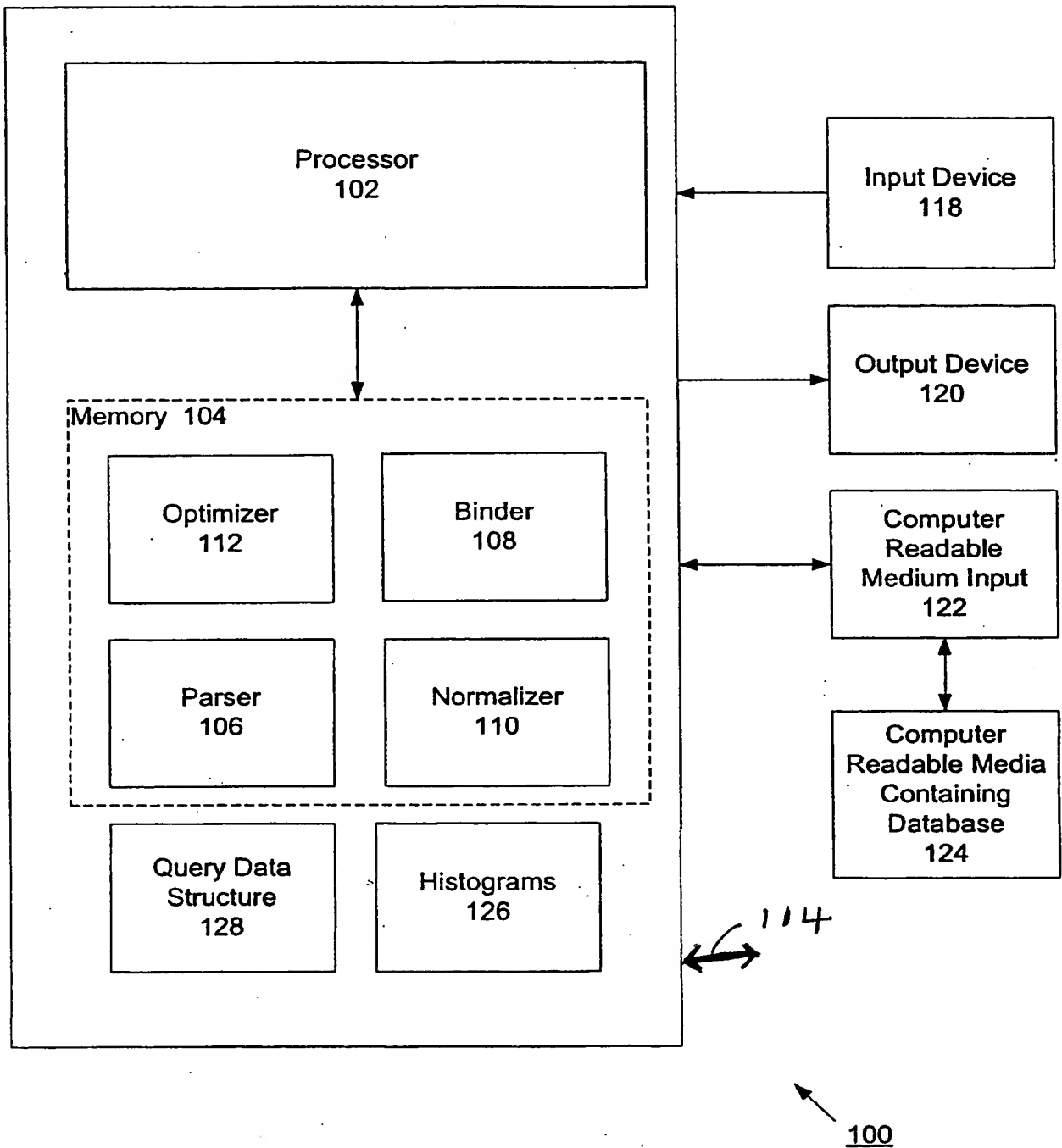P.O. Box 272400
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Processor
102

Input Device
118

Output Device
120

Memory 104

Optimizer
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Binder
108

Parser
106

Normalizer
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Computer
Readable
Medium Input
122

Computer
Readable Media
Containing
Database
124

Query Data
Structure
128

Histograms
126

114

100

Figure 1